Dowel Bar Retrofit

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Outline

- Introduction
- Dowel bar retrofit
- Diamond grinding

Introduction

- **PCCP location**
  - 13% of total network lane kilometers
  - 48% of total interstate lane kilometers
- **Majority constructed under Interstate Highway Construction Program (1960's)**
- **Experienced 2 to 5 times design traffic loads**

Pavement Design

Prior to 1990's

- **9 inch thickness**
- **No dowels bars at transverse joints**
- **Tie bars at horizontal joints**
- **4 inch base**
  - Crushed stone
  - ATB
  - CTB

Current

- **9 to 12 inch thickness**
- **1-1/2 inch dowel bars at transverse joints**
- **Tie bars at horizontal joints**
- **4 inch base**
  - Crushed stone
  - Asphalt

Joint Spacing

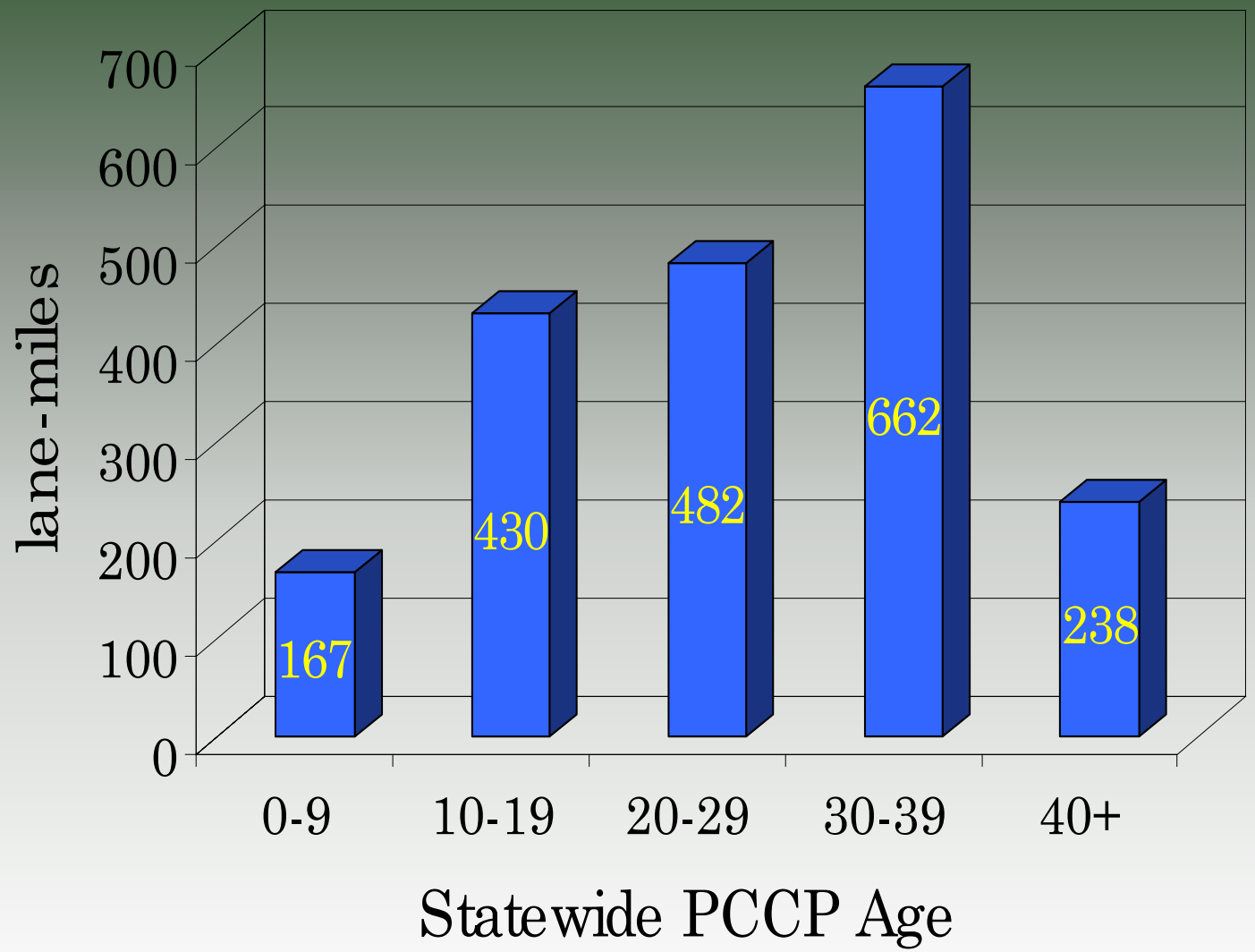
Prior to 1980

- **Straight joints**
- **15 foot joint spacing**

Current

- **Random/Skewed**
  - 9, 10, 13, 14 feet
  - 2 ft in 12 ft width
- **Doweled**
  - Straight joints
  - 15 ft joint spacing

PCC Pavement Age



Typical Concrete Distress in Washington State

Longitudinal Cracking

- traffic load fatigue
- late sawing
- shallow saw cuts
- use of plastic inserts

Transverse Cracking

- late sawing
- traffic load fatigue
- slab curl

Corner Breaks

- loss of support
- curling and warping

Spalling

- breaking away of concrete from joints and cracks
- typically starts due to incompressible in joint

Faulting

- heavy loads
- excess moisture
- fine grained base or subgrade
- load transfer deficiency

Surface Wear

- studded tires
- leaves smooth polished surface
- surface friction

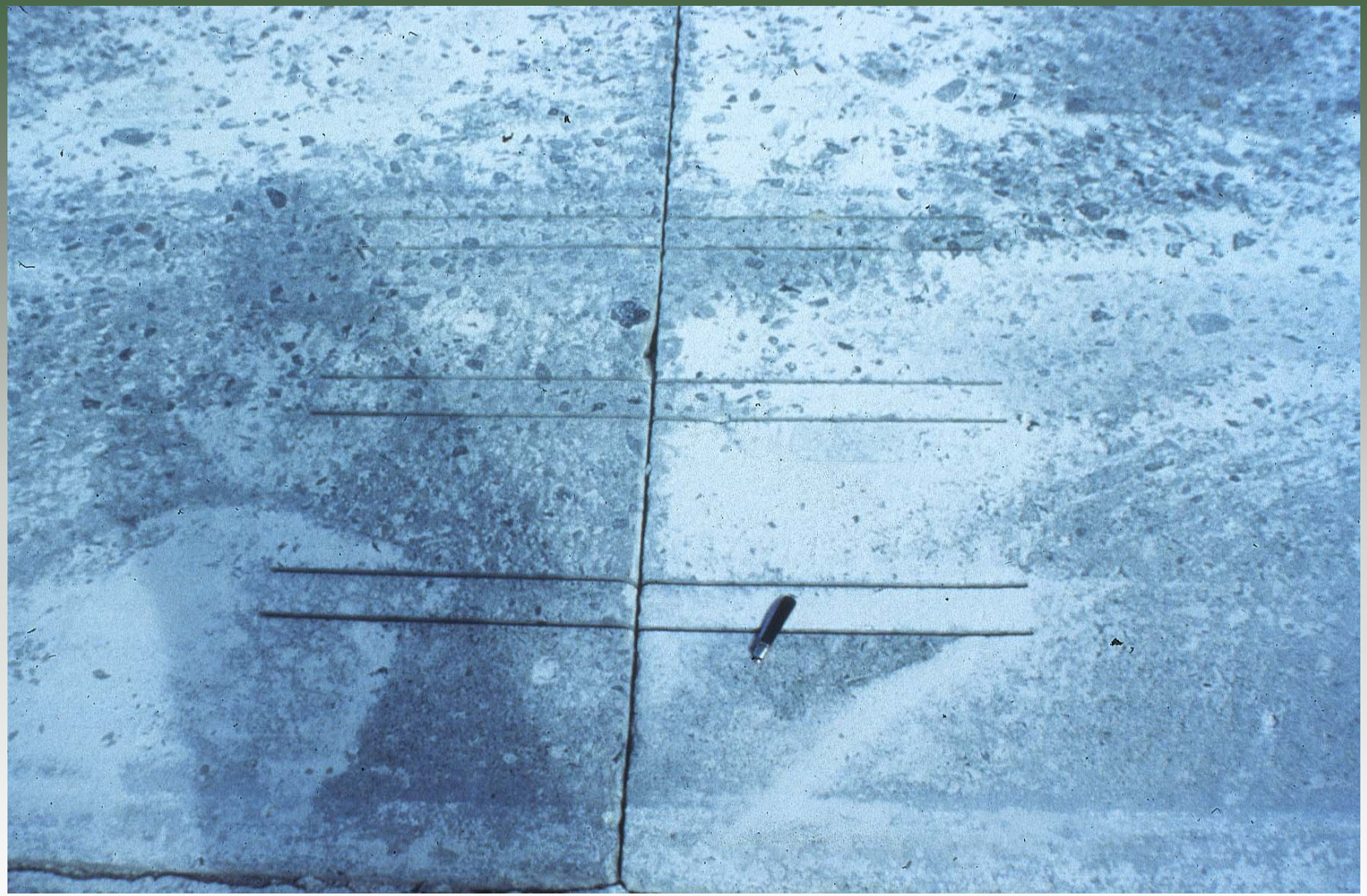
Dowel Bar Retrofit

- Restore load transfer
- 1-1/5 inch epoxy coated dowel bars
- 6 bars per transverse joint or transverse crack
- Diamond grinding

Cutting slots

Saw blade placement

Sawed slots



Removing material from slot

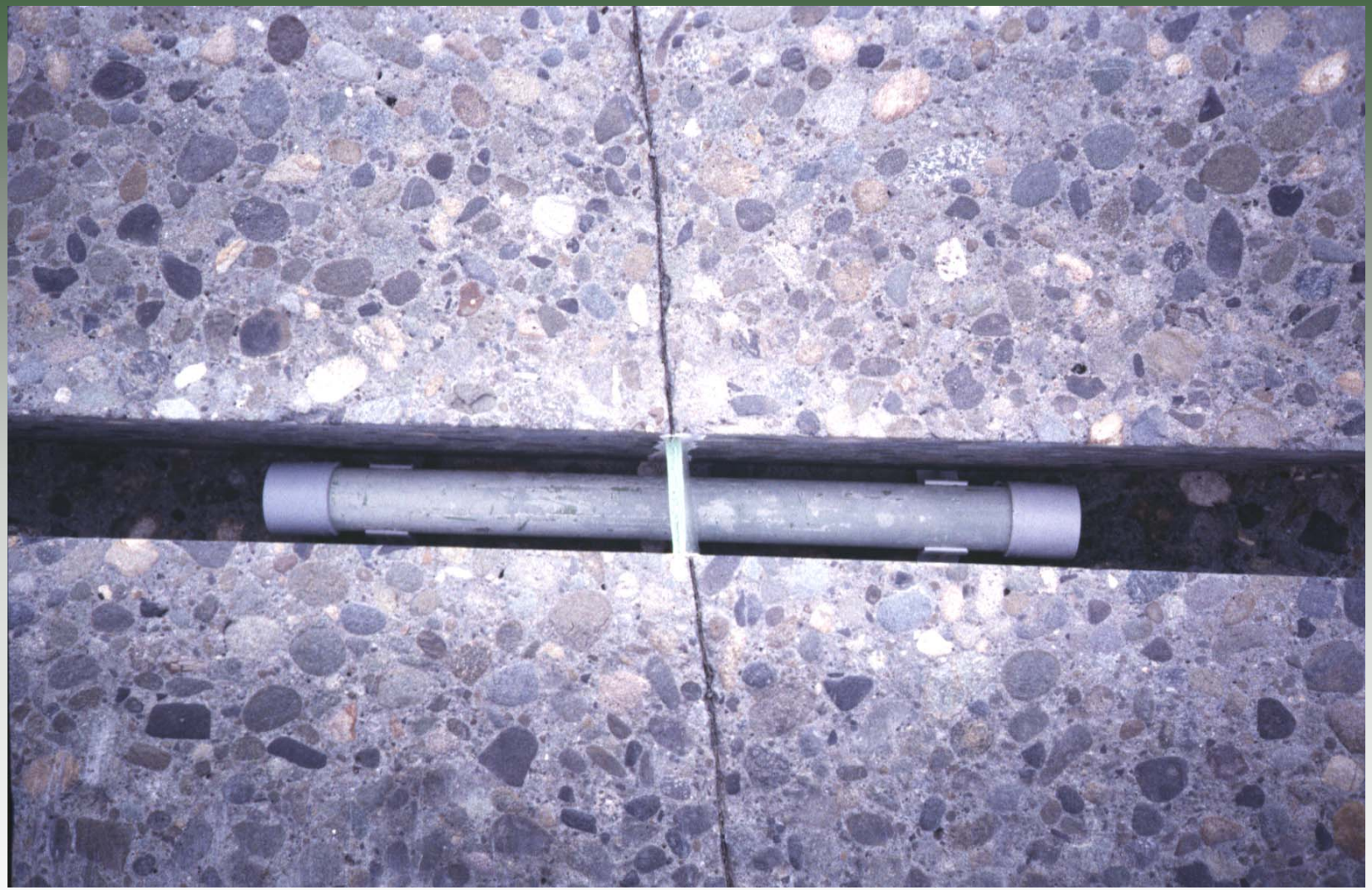
Sand blasting slots

Silicone sealant in joint

Dowel bars

Placing dowel bars in slots

Placement of dowel bar in slot



Placement of grout

Consolidating grout

Striking of excess

Diamond Grinding

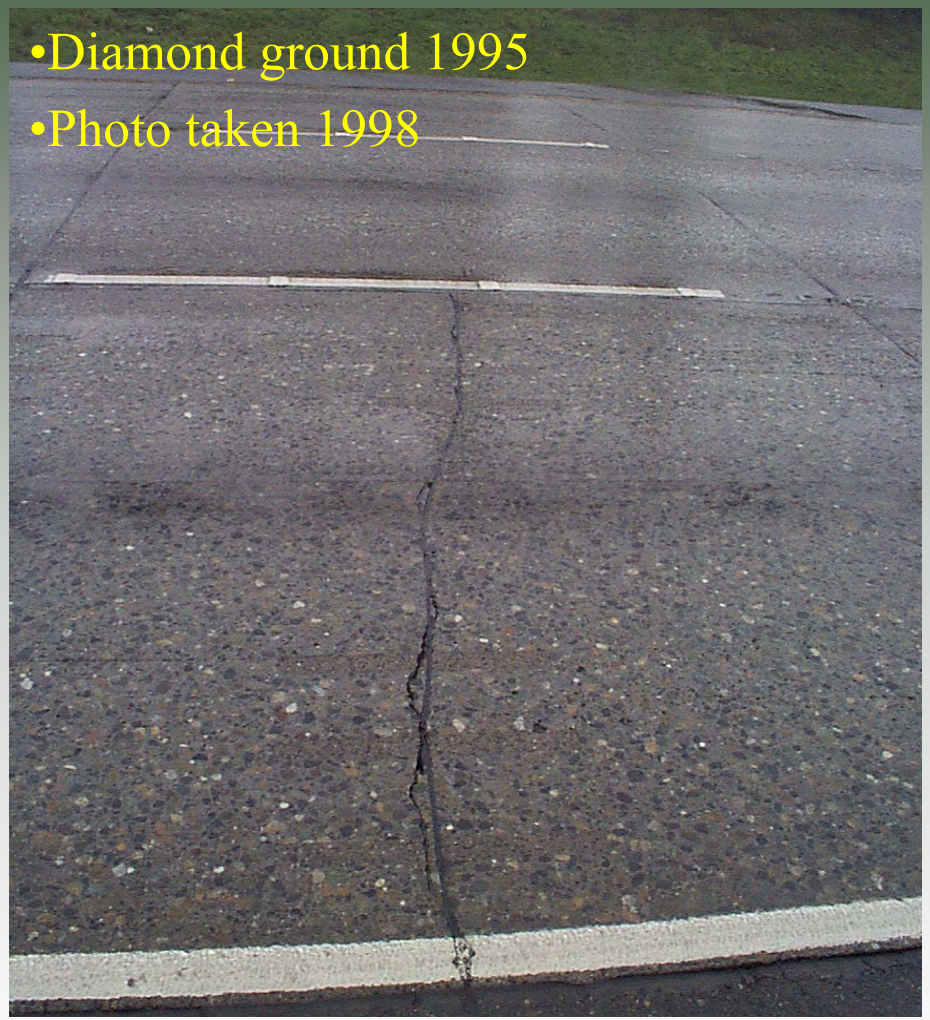
- **Restores pavement ride**
  - Removes faulting
  - Removes wear
- **Retexture roadway**

Diamond grinding

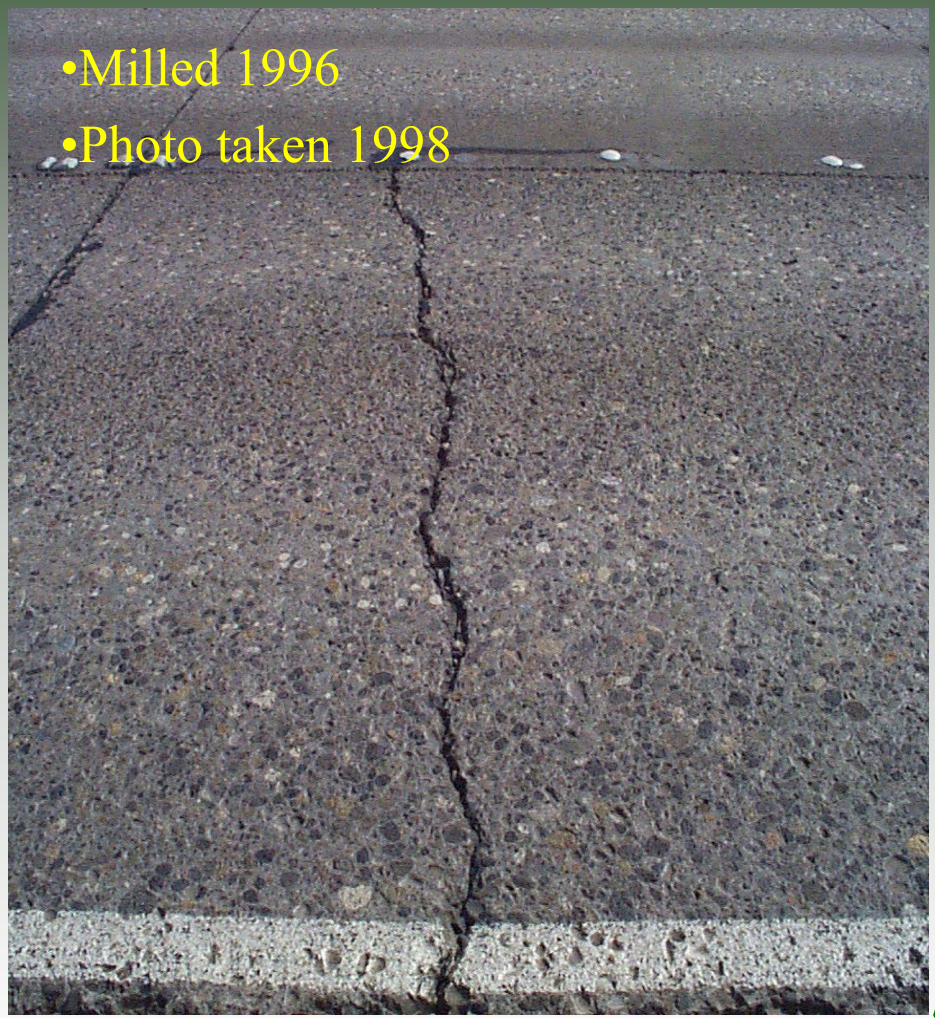
Diamond Ground Surface

Milled Surface

Diamond Ground Surface



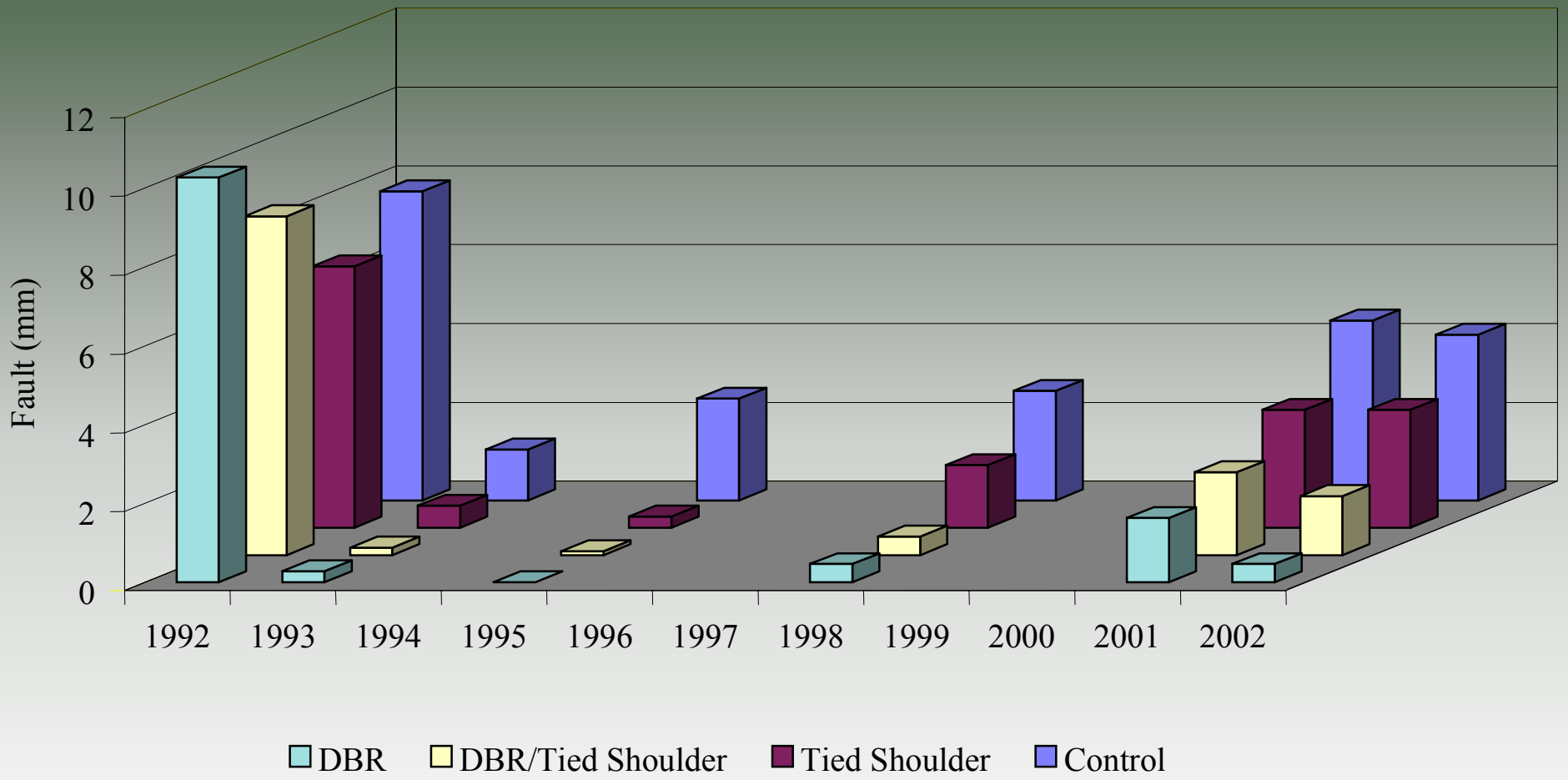
Milled Surface



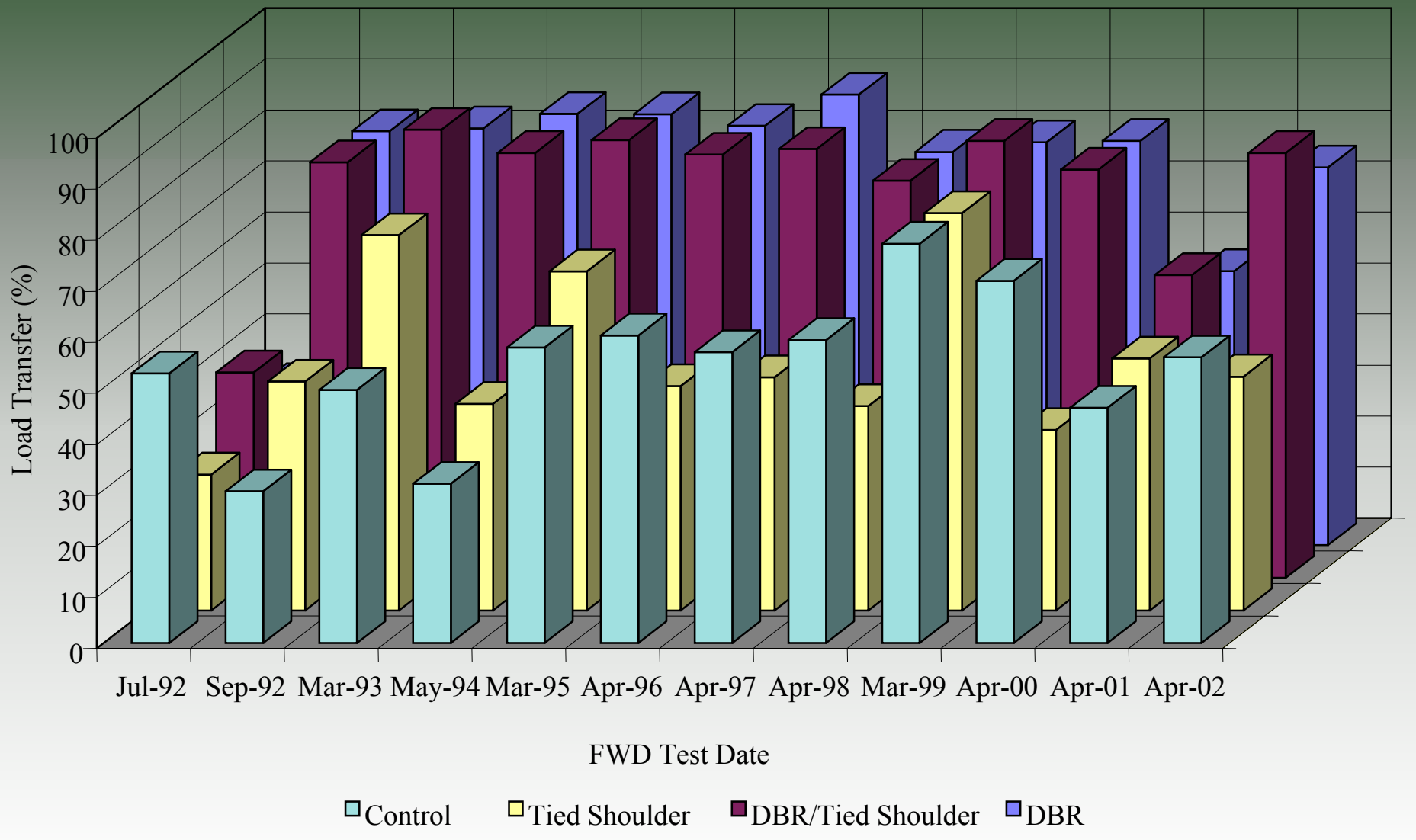
DBR Projects

- 20 projects completed statewide (1993 - 2002)
- 250 lane miles retrofitted

DBR Test Section - faulting

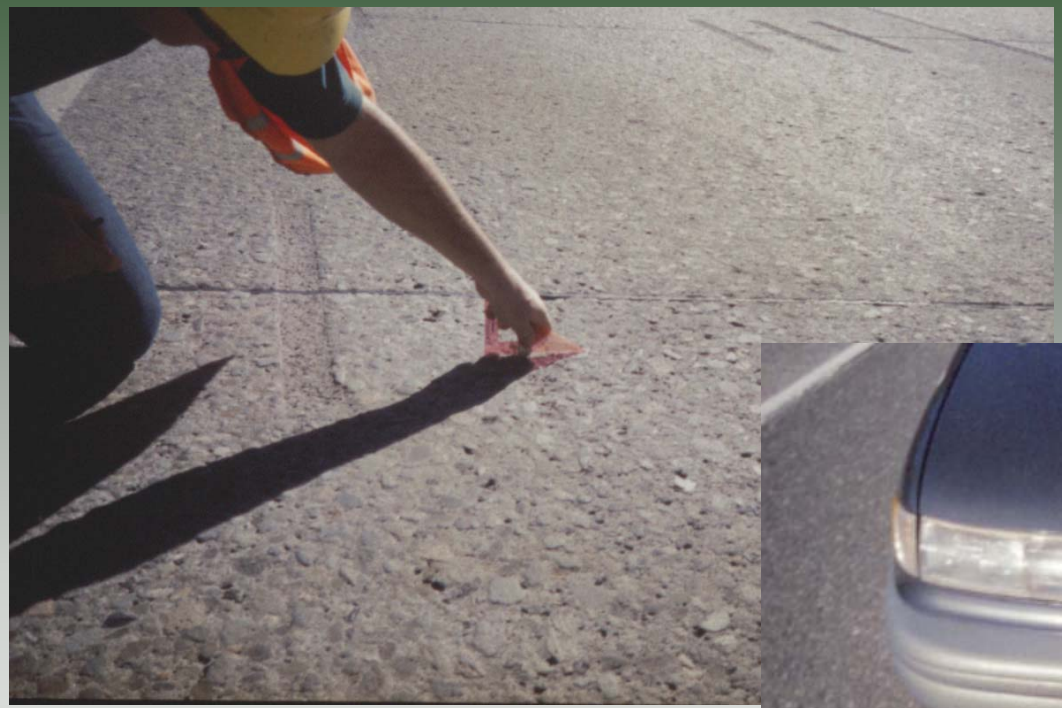


DBR Test Section - load transfer

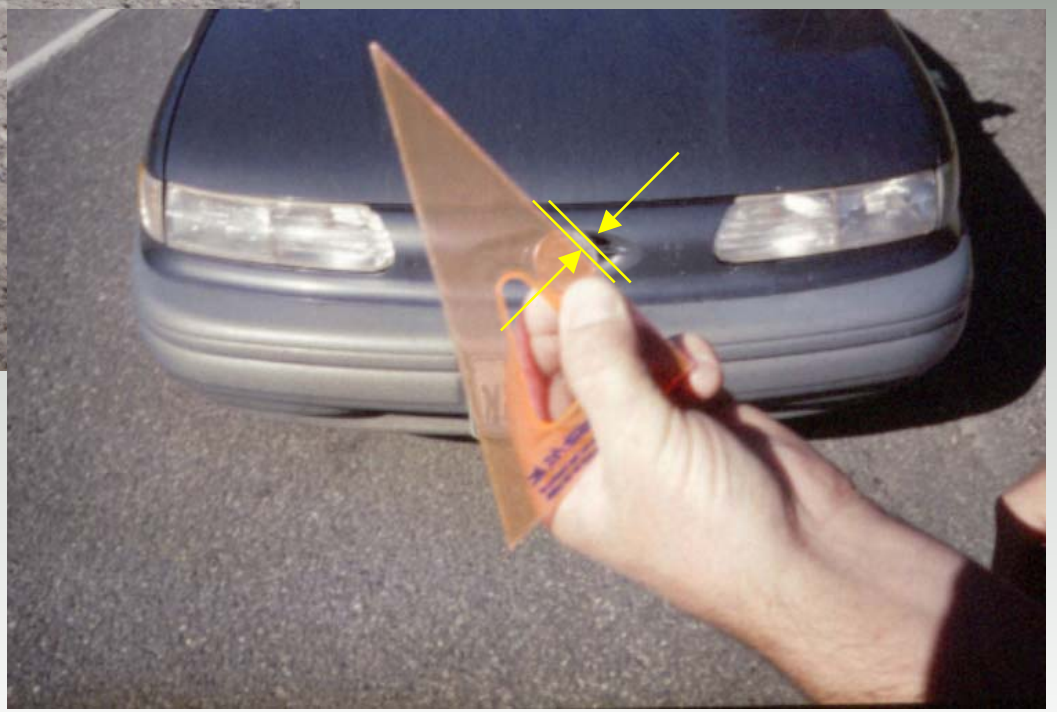


Pavement Cores

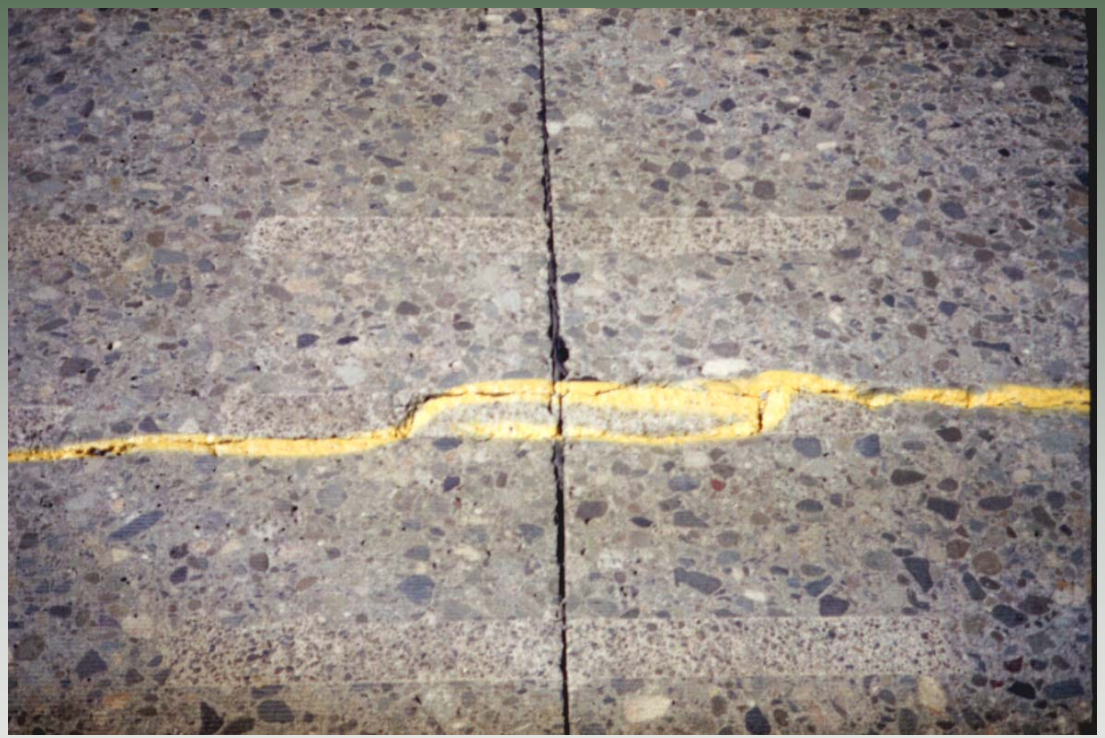
Studded Tire Wear



3/16 inch (4.8 mm)



Longitudinal Cracking



Construction Related Cracking